Tucker (W. G.)

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Extracted from the TRANSACTIONS OF THE ALBANY INSTITUTE.

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ALCOHOL — IS IT A FOOD?

By Willis G. Tucker, M.D.

[Read before the Albany Institute, March 6, 1877.]

The uses, abuses and effects upon the system of alcoholic drinks, are subjects which have been much discussed, and which may be viewed from a variety of standpoints. The moralist considers the influence exerted by their use upon society at large; the jurist seeks to determine what laws should be enacted to regulate their production and govern their sale; the physiologist busies himself with investigating their action upon the human system in a state of health, and the medical man studies the results which follow their administration in disease and their value as remedial agents. Each of these points of view is separate and distinct, and if discussions upon the alcohol question are ever to prove of value, their range must be limited within natural bounds. Questions so important as those which arise when the uses of alcohol are discussed, should be dealt with rationally and logically. The wholesale denunciations, arbitrary dogmatical assertions, and distorted statistical statements so often put forth as arguments by those who feel themselves called upon to agitate these questions, are entirely out of place in the discussion of such important themes.

Dismissing, then, all reference to those relations which alcohol bears to social science, the law and to medicine, let me ask your attention for a few moments this evening to a single point connected with its physiological action — our query being, are the effects of alcohol upon the system such as will entitle it to a place among foods?

Of alcohol, by way of definition, little need be said, save that it is a chemical product resulting from vinous fermentation, an obscure process in which sugar is transformed through the agency of some nitrogenized albumenoid

substance or ferment into alcohol and carbonic acid, and that it is the most important constitutent in all liquids classed as intoxicating. It matters not whether they be the lightest fermented liquors or the strongest distilled spirits, they all owe their excitant properties to the alcohol which they contain in quantities varying from two to fifty-five parts in one-hundred by volume. These liquids, if imbibed in quantities proportional to the amount of alcohol contained in them, would produce precisely similar effects were not to the properties of the alcohol added those of the other substances with which it is combined. Thus champagne is doubly stimulating from the free carbonic acid gas which it contains; port possesses astringency which it owes to its tannic acid; gin the power of affecting the kidneys, due to its juniper; whiskey is regarded as slightly aperient, while brandy is believed to produce a contrary effect. Fermented liquors containing hops are held to possess tonic properties, while the sugars, starchy matters and albumenoid substances which they contain are undoubtedly, so far as they go, true nutrients. Such differences as these are however secondary and of comparatively little importance. The primary constitutional effects produced by different liquors depend upon the alcohol, are essentially the same in all cases, and proportional to the amount contained in any given volume. The idea that pure alcohol, when properly diluted, is poisonous, or that its properties are *materially* altered by the other substances with which in wines and spirits it is blended, and which give to these liquors their delicate odors and fine flavors, is entirely wrong. If some liquors are especially deleterious, it is not because the *alcohol* in them is ranker, but it is due to the fact that the fusel oil or other impurities have not been properly separated from them, or that they have been purposely adulterated. Wines and distilled liquors are mellowed and improved by age, but the process depends

upon the development of various ethers and volatile principles, and not upon change which the alcohol undergoes. Indeed, of late years, pure alcohol has been medicinally employed to a considerable extent and with as good results as those which follow the administration of whiskey or brandy.

Under the general term ALCOHOL, then, we include all those liquids which, containing it in varying quantities, are used as stimulants, and are capable of producing intoxication. In attempting to define the term food, we meet with greater difficulty. The dictionary definitions are most of them quite unsatisfactory, comprehending many substances which cannot properly be considered foods, and excluding others which are essential. The physiologists are scarcely more exact and in their definitions show a very great diversity. A well known authority includes under the term food, "all those substances, solid and liquid, which are necessary to sustain the process of nutrition." He evidently means those substances which are capable of sustaining or contribute to the sustenance of the process of nutrition. The definition of another physiologist includes not only all those substances capable themselves of nourishing the body, but also all others which may indirectly accomplish the same end "by influencing favorably the process of nutrition or by retarding destructive assimilation." This seems too broad. Dr. Edward Smith in his excellent little treatise on *Foods* is fortunate in his choice of words when he says that "a food is a substance which when introduced into the body supplies material which renews some structure or maintains some vital process."[1] The word *maintains* is important; a medicine may modify a vital process; a food maintains it. Accepting then this definition as satisfactory, although it is broader than at first

[1] Smith, *Foods*, New York, 1874, p. 1.

sight would appear and includes many substances not ordinarily ranked as foods, we see that it but expresses the well known fact that food is required by the body for two great purposes,— to renew its structure and to maintain the vital processes, chief among which is the production of heat. Few single substances, it is true, produce solely the one or the other effect, but yet any given article acts chiefly either as a tissue former or a heat producer. The first class, or tissueformers, are nitrogenized substances from which, combined with mineral matter, the whole frame work of the body is made up. Fat alone, a substance which may almost be regarded as extraneous or non-essential, save that it furnishes a supply from which the heat of our bodies may be kept up for a time if food is cut off, contains no nitrogen. The essential constituents of the body, the fibrine, ossein, cartilagin, albumen, and similar principles are all nitrogenized substances. The second class, the heat producers or respiratory foods, are non-nitrogenized bodies containing carbon, hydrogen and oxygen. Now if alcohol acts as a true food it is evident that it must do so either by a conversion into some nitrogenized proximate principle, or by undergoing oxidation within the body and evolving heat or other form of force.

Having glanced at these elementary physiological facts let us now inquire what evidence there is to prove that it is capable of accomplishing either result.

The claim that alcohol can be converted into tissue substance proper is now less frequently made than heretofore. The attempt has often been made to prove it, but all efforts in this direction have failed, and there are no reliable facts which can be adduced to show that such a change ever does take place. Still that the assertion is made without even an attempt at proof may be seen from the following quotation from a well-known standard treatise on therapeutics by an eminent medical authority. The author says: "Alcohol is itself, in all probability, assimilated.

What else becomes of it? It is probably converted into some one or more of the proximate constituents of the body; and I am among those who believe that it may, through the agency of the vital forces, and in the presence of organized nitrogenous matter, be converted into any one or all of these constituents, excepting only the mineral." Now it is easy to build up theories to support mere opinions, but such labor is worse than useless because it does no good and leads into error. Pray note the query, "What else becomes of it" for it illustrates a style of reasoning which, it must be acknowledged, too frequently obtains in medical works. Why should we ascribe to the vital forces,— forces, of which if any exist distinct from atomic and molecular forces recognized as chemical and physical, we know nothing,— all those changes which, going on within our bodies, seem beyond our comprehension. Such as these are the most futile of hypotheses because they are based upon nothing but ignorance.

It would be a waste of time to enter upon a discussion of this question. It would subserve no good purpose to point out those writers who have held an opinion based only upon an absence of proof. Not only have all attempts to show that alcohol may be assimilated, or rather, converted into assimilable substances, failed, but we may go further and assert that there are many facts which go to prove that it positively interferes with the processes of nutrition. Dr. Beaumont's experiments upon St. Martin,— that singular man who, as the result of accident, lived for many years with a perforation in his side opening into his stomach, through which its interior might be observed and the processes of digestion studied,— proved that "the free use of ardent spirits, wine, beer or any intoxicating liquor, when continued for some days, invariably produced morbid changes," [1] — changes which he described at length.

[1] Beaumont, *The Physiology of Digestion*, Burlington, 1847, p. 254.

Among his inferences, deduced from the results of hundreds of experiments which he conducted upon St. Martin, the thirteenth is that "the use of ardent spirits always produces disease of the stomach if persevered in."[1] Now the term 'disease' is somewhat vague, but whether we accept Beaumont's statement or not, we need not stop to argue that digestion and assimilation can never proceed to advantage if the functions of the stomach be interfered with, even if it be not actually diseased. But supposing that alcohol is so taken as not even to interfere with the process of stomach digestion there is every reason for believing that it not only fails to act as an alimentary principle, but that it seriously interferes with the assimilation of those true nutrients which should constitute our food. Flint, in his *Physiology of Man*, says: "alcohol diminishes the activity of nutrition. If it be long continued the assimilative powers of the system become so weakened that the proper quantity of food cannot be appropriated, and alcohol is craved to supply a self-engendered want."[2] Again he says: "the effects of its continued use, conjoined with insufficient nourishment, show that it cannot take the place of assimilable matter. These effects are too well known to the physician, particularly in hospital practice, to need further comment."[3]

It must be admitted, however, that such statements rest more upon the general results gained from experience than upon absolute experimental proof, and that it is difficult to judge accurately of the rapidity and nature of the reparative processes which are going on within the body, so that while we may entertain no doubt as to the influence of alcohol upon them, we may not find it easy to demonstrate

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[1] *Ibid*, p. 300.

[2] Flint, *Physiology of Man*, New York, 1873, vol. II, p. 108.

[3] *Ibid*, p. 109.

it. But in those cases in which there is an extraordinary demand made upon these regenerative powers, as for example in the repair of injuries resulting from accident or disease, we are enabled to form a pretty correct judgment of the effects of alcohol upon them. Now Dr. Carpenter, in his *Prize Essay on the Use and Abuse of Alcoholic Liquors*, has shown that in those who habitually use alcoholic drinks, union of wounds does not take place so readily by 'first intention,' as in those who abstain from them. He cites the experience of Havelock in India who in his *Narrative*, referring to the wounded after the victories in India, says: "The medical officers of this army have distinctly attributed to their previous abstinence from strong drink the rapid recovery of the wounded at Ghuznee,[1] and also quotes from Atkinson, who in his work on Afghanistan states, more explicitly, that "all the sword cuts, which were very numerous, and many of them very deep, united in a most satisfactory manner, which he decidedly attributed to the men having been without rum for the previous six weeks."[1] To these statements, so many others of similar bearing might be added that we seem justified in the belief,— and more especially when the fact that no positive evidence can be adduced to prove that alcohol is capable of assimilation is taken into consideration,— that alcohol is not only incapable of being transformed into any of those substances of which the tissues are made up, but that it actually interferes with the nutritive and reparative processes. As to this view there seems to be now but little if any difference of opinion among recent writers and observers.

But it has often been urged, if alcohol cannot be transformed into nitrogenized substances, may it not be con-

[1] Carpenter, *op. cit.* p. 136.

[2] *Ibid*, p. 137.

verted into fat, of which it contains all the elements, and may not this fat be stored up and afterwards by its combustion furnish heat and force. Such a view of the subject is at first sight plausible, and the results of certain physiological experiments would seem to show that such a change might take place, but let us remember that those liquors which are, by common consent, the most fattening, are those which contain sugar and starchy matter in the greatest abundance. Beer drinkers may become bloated; spirit drinkers seldom. Let us also remember that the sleepy quiet induced by excessive potations may contribute towards the deposition of fat. True it is that in certain cases of confirmed inebriates a deposition of fatty matter does take place around and about the viscera, and that frequently vital organs themselves undergo a fatty change, but I need not remark that it is by no means to be desired that this substance, useful enough no doubt in its place, should be interlarded with the muscular fibres of our hearts, or disseminated through our livers and kidneys. Such depositions and changes of structure are degenerative and abnormal, and take placé moreover in those who entirely abstain from alcoholic drinks. Dr. Richardson of London, whose recently printed "Cantor Lectures" *On Alcohol* have attracted much attention, asserts[1] that there is "no obvious chemical fact which supports the hypothesis" that alcohol may be transformed into fat. We believe that within the body sugar may be so transformed and we know also that it may be converted into alcohol, but as yet see no way by which alcohol may be changed back to sugar or directly into fat. We hold that neither by physiological experiments nor logical deduction from observed facts can it be shown that alcohol is a fattening agent.

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[1] Richardson, *op. cit.* p. 61.

Again, it is urged, and with some show of reason, doubtless, that if alcohol is not a direct tissue-forming food, it may at least retard tissue change and diminish the wear and tear of the system. I say with some show of reason, for there is no doubt that, under certain circumstances, when alcohol is imbibed, either less food is required, or the body gains in weight while the excretions diminish. The experiments conducted by Dr. Hammond[1] prove this. But the question then arises, why is less food required, why are the excretions diminished? Surely alcohol cannot create force. Is not the system then debilitated and unfitted for doing its ordinary amount of work, and is not this the reason why it requires less food to support it? An engine run at fifty strokes a minute needs less fuel, but furnishes less power than if the number of strokes be doubled.

Dismissing then the further consideration of alcohol as a tissue-former or a preservative agent, let us now inquire whether it may act as a respiratory or heat-producing food. The impression that until quite recently has very generally obtained is that part at least of the alcohol absorbed after ingestion is carried with the blood to the lungs, where it is rapidly oxidized with the production of carbonic acid and water which are thrown off with the expired air, and that during this chemical change heat is evolved and the temperature of the body raised. Indeed this view is still pretty generally held by those who have failed to keep pace with the advances which physiological science has during late years been making. The idea that alcohol increases bodily heat was for so long a time taken for granted,— statements to that effect were so long allowed to pass unchallenged,— that the belief probably gave rise to the theory that

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[1] Hammond, *The Physiological Effects of Alcohol and Tobacco upon the Human System, Physiological Memoirs*, Phila., 1863, p. 48.

alcohol undergoes rapid oxidation or combustion within the system. Thus Bouchardat and Sandras asserted positively in 1847, that alcohol is speedily converted by the inspired oxygen into carbonic acid and water,[1] and the late Professor Johnston in his *Chemistry of Common Life*, says that ardent spirits "directly warm the body and by the changes they undergo in the blood supply a portion of the carbonic acid and watery vapor which, as a necessity of life, are continually being given off by the lungs."[2] Liebig, as is well known, held the same opinion[3] and in his *Chemical Letters* places "spirits" among respiratory foods.[4] Dr Thudichum has declared himself of the same belief, founding it, it would seem illogically, upon the fact that in a number of experiments which he conducted, but a minute portion of the alcohol administered escaped from the body unchanged. He therefore draws the inference that it must of necessity have undergone rapid oxidation and acted as a true food.[5] Stillé in the last edition of his work on *Therapeutics and Materia Medica* presents arguments to prove that the temperature of the body is raised by alcoholic drinks.[6] Dr. Prout held that the temperature was first diminished but afterwards increased by their administration,[7] and we even find Dr. Edward Smith asserting as late as in 1873, in his work on *Foods* to which reference has been made, that spirits of wine cause an increase in the amount of carbonic acid exhaled while brandy, whiskey and gin lessen it.[8] As no explanation is offered for this

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[1] *Annuaire de Therapeutique*, 1847, p. 279.

[2] Johnston, *Chemistry of Common Life*, N. Y., 1873, vol. I, p. 288.

[3] *Animal Chemistry*, Part I, p. 96.

[4] *Familiar Letters on Chemistry*, Lond., 1854, vol. II, p. 106.

[5] Letheby *On Food*, N. Y., 1872, p. 92.

[6] Stillé, *op. cit.*, vol. I, pp. 729–741.

[7] *Edinburgh Med. and Surg. Journal*, July, 1851.

[8] *Op. cit*, p. 377, *et seq.*

remarkable fact, nor indeed can be, we must dismiss it as fallacious. Carpenter in his *Prize Essay* says: "The power of alcoholic liquors to enable the body to resist the depressing influence of external cold is perhaps the best established of all its attributes. * * * * This is by no means surprising. The genial warmth which is experienced for a time when a glass of spirits is taken on a cold day, appears to afford unmistakable evidence of this heat-producing power, and the chemical properties of alcohol would seem to indicate that under such circumstances it does not merely act as a stimulant * * * * but that it also offers the material for that combustive process, by which the heat of the body is sustained, in a form peculiarly suitable for rapid and energetic appropriation to this purpose."[1]

Now the results, almost without exception, of later carefully conducted experiments go to show that alcohol does *not* increase the quantity of carbonic acid in the expired air, but diminishes it, and that it does *not* augment the bodily temperature, but markedly lessens it. Regarding the carbonic acid, the quantity of which would be greatly increased were alcohol directly oxidized in the system with the production of heat, Dr. Prout showed thirty-five years since, that the amount is invariably but not uniformly lessened by the administration of alcohol.[2] Böcker has shown that "in his own case during the use of alcohol the exhalation of carbonic acid from the lungs in twenty-four hours was less than the normal quantity by 165,744 cubic centemetres"[3] equal to about 5.8 cubic feet. Dr. Hammond, in experiments conducted upon his own person observed a constant diminution in the amount of car-

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[1] Carpenter, *op. cit*, Phila., 1860, p. 96.

[2] *London Lancet*, 1842–43, II, p. 17.

[3] Stillé, *op. cit.*, vol. I, p. 741.

bonic acid exhaled following the ingestion of four drachms of alcohol three times a day for five days.[1] Dr. N. S. Davis of Chicago states, that the diminution of carbonic acid amounts sometimes to fifty per cent, two hours after a dose of alcohol has been taken,[2] and Perrin,[3] Horn,[4] Vierordt,[5] and many other experimenters give equally positive testimony. And as to the calorific power of alcohol, contrary to what is considered the general experience, and to the statements of the authors quoted, together with many others not mentioned, it is capable of direct proof that its administration causes in man, and in many other of the warm-blooded animals, a decided fall of temperature. Indeed alcohol is now employed as an antipyretic in fevers. There may be at first a slight rise of surface temperature, quickly subsiding and there is undoubtedly experienced a feeling of warmth in the extremities and a certain glow on the surface following the ingestion of alcoholic liquids, but this proceeds in reality from a cooling process which results from the increased supply of blood sent to the capillaries of the surface which, with its temperature lowered, is returned to the heart. This effect is believed to depend upon the action of the alcohol upon the ganglionic nervous system. The control which the nervous filaments exert upon the capillaries is weakened; the normal state of tonicity gives place to a flaccid dilatation; the vessels become distended with blood; a greater quantity is sent to the part, and, therefore, the check upon the heart being relaxed, its pulsations become more frequent. Not only is the blood being more rapidly cooled but an extra amount of work is necessarily put upon the heart.

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[1] *Op. cit.*, p. 48.

[2] *Trans. Am. Med. Ass'n.*, vol. VIII, p. 577.

[3] *Archives générales*, 6th series, vol. IV.

[4] Flint, *op. cit.*, vol. I, p. 437.

[5] *Ibid.*

So long ago as in 1848, Duméril and Demarquay asserted that after the administration of large doses of alcohol, there was a fall of temperature.[1] Dr. Davis's experiments gave similar results over twenty years since,[2] and those performed by Dr. Richardson show that with few exceptions, small doses of alcohol lower the bodily temperature, and that without exception the administration of quantities sufficient to produce intoxication causes a very decided fall.[3] Indeed he points out that the sleep of apoplexy may easily be distinguished from that of drunkenness by this fact alone; that in the one case the temperature is above, in the other below the normal standard of 98.5°. He is of the opinion, and who can doubt it, that life is often lost by thrusting intoxicated persons into the cold, damp cells of prisons.[4] A person in such a condition should always be kept warm.

The statements of nearly all recent observers, to a host of whom reference might be made, agree upon this point and Dr. Hayes' experience in the use of alcoholic liquors in polar regions fully corroborates the testimony of scientific observers. He says: "While fresh animal food, and especially fat, is absolutely essential to the inhabitants and travellers in arctic countries, alcohol is, in almost any shape, not only completely useless but positively injurious. * * * * Circumstances may occur under which its administration seems necessary, such for instance, as great prostration from long continued exposure and exertion or from getting wet; but then it should be avoided if possible, for the succeeding reaction is always to be dreaded; and if a place of safety is not near at hand the immediate danger

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[1] H. C. Word *Therapeutics, Materia Medica and Toxicology*, Phila., 1874, p. 103.

[2] *Trans. Am. Med. As'sn.*, vol. VIII, p. 577.

[3] Richardson, *op. cit.*, p. 68, *et seq.*

[4] *Ibid.*

is only temporarily guarded against, and becomes finally greatly augmented by reason of decreased vitality. If given at all it should be in very small quantities frequently repeated and continued until a place of safety is reached. I have known the most unpleasant consequences to result from the injudicious use of whiskey for the purpose of temporary stimulation, and have also known strong, able bodied men to become utterly incapable of resisting cold in consequence of the long continued use of alcoholic drinks."[1] Alcohol then is not a heat-engendering food, but, on the contrary, cold and alcohol are similar agents, and the popular plan of administering the latter to counteract the effects of the former is based upon a fallacy and may be productive of dangerous and even fatal results. As a medicine alcohol may do good *after* exposure to cold by quickening the circulation and producing a temporary stimulant effect, but it should only be administered when the means for supplying artificial warmth externally are at hand.

Still further we hear it alleged by those who admit that alcohol can neither renew structure nor evolve heat, that it furnishes force by its oxidation, which sustains the vital processes. It is said that alcohol is an agent which will burn inside as outside the body, and that the force evolved in its combustion represents a certain amount of work, but that in supplying force to the system by its decomposition, heat becomes latent, a fact which explains the diminished temperature observed after the absorption of alcohol. This view of the case has been ably presented during the present year by a writer in one of our medical journals. The writer takes the ground that alcohol must operate by

[1] Hayes, *Observations on the Relations existing between Food and the Capabilities of Man to resist low Temperatures.—Am. Journ. of the Med. Sciences*, July, 1859, p. 117.

one of three methods; by checking waste; by a so called stimulant action, or by becoming a material with which to carry on the processes of oxidation and nutrition, and deflecting them from a less to a more healthy action. If now, he argues, it can be shown that alcohol is decomposed within the system, the first and second veiws fall to the ground, since the power to check waste by a coagulation of the bodily tissues or to goad them into greater action is attributed to alcohol only and not to any of the products of its decomposition. From the experiments of Dupré and Anstie he then shows that within certain limits absorbed alcohol is decomposed within the system and but a minute quantity eliminated unchanged — and of this fact there is of course no doubt — and comes to the conclusion that alcohol operates by overcoming the opposition or resistance displayed by the molecules of the body, which, by their coming together, perform the various mechânical movements which the body is capable of making and that this is the "interior work which is performed by heat in the body,"— "the process of forcing the molecules to take up new positions."

Now this is ingenious and part of the reasoning rests on fact but the conclusions seems faulty because the data upon which they are based are mere assumptions. In other words if we would accept this theory it must either be shown that the process of decomposition which alcohol undergoes in its passage through the system is one of rapid oxidation analogous to combustion, or that it imparts force and enables the system to do a greater amount of work. Let us consider each position separately and briefly.

And first, as to the decomposition of alcohol, we are to remember that there are two ways in which it may oxidize; either actively as in its combustion with the produc-

tion of carbonic acid and water as represented by the reaction:

Alcohol. Carbonic acid. Water.

$$C^2 H^6 O + O^6 = 2\ C\ O^2 + 3\ H^2O$$

or passively with the formation of aldehyde and acetic acid as in the manufacture of vinegar, thus:

Alcohol. Aldehyde. Water.

$$(1)\ C^2 H^6\ O + O = C^2 H^4\ O + H^2\ O.$$

Aldehyde. Acetic acid.

$$(2)\ C^2 H^4\ O + O = C^2 H^4\ O^2.$$

Now while either of these changes, and perhaps others, may take place, it must after all be admitted that up to the present we know very little of the actual processes by which alcohol is decomposed in the system and that the transformations which it undergoes must be more complicated than shown in these reaction, because none of the products given in either can be found to exist in appreciable or increased quantities in the excretions. The subject is one which is now being investigated by experimenters and on which at present we possess but little reliable information, but it seems more rational to suppose that the aldehyde and acetic acid might escape notice or assume other forms than that the carbonic acid which would be formed in large quantity[1] in the first case, could be eliminated from the system unnoticed or enter into other combinations.

But secondly, as regards the physical results, we are to note that in the case of rapid oxidation either heat or force must be generated, while in the event of passive oxidation but little heat is engendered and therefore but little force evolved. We have seen that alcohol lessens the temperature; now does it impart force or strength — does it enable the body to do a greater amount of work? We hear it said, and this is substantially the ground taken in the paper to which reference has been made, that alcohol not only

[1] One ounce of alcohol by its combustion furnishes $1\frac{1}{15}$th cubic feet of carbonic acid gas.

supports the system in disease, but enables man to endure fatigue and bear up under protracted exertion. This position, the truth of which is never questioned by many persons, we believe to be essentially false. There are times when alcohol cheers, refreshes, re-invigorates, and in some such cases it does good, but such uses are properly medicinal. It is after fatiguing labor and when, no further exertion being called for, we can guard against the effects of reaction, that alcohol is of service; not while we must still labor and can obtain neither food nor rest. We all remember the story of Franklin and the apprentices, and in this anecdote there is doubtless more of truth than of fiction. I do not believe that the report of travellers and explorers; of those generally who have had sufficient experience to enable them to form an intelligent opinion, will show that the habitual use of alcoholic drinks relieves fatigue or sustains the system when it is exposed to continued hardships. On the contrary I believe that the experience of those who have seen them used in the army and upon ship-board, of those who have observed their effects in polar and in tropical regions, where the greatest fatigue and privations were of necessity endured, will bear out the statement that alcohol has no value as a means of support under such trying circumstances. In confirmation of this view I would call attention to the results observed in the recent English expedition of '75-76, to the polar regions under Captain Nares as stated in a report published in the London *Times*. According to this report there were in the ship six 'teetotalars' and it appeared that these were far less liable than their mates to scurvy or frost-bite. "In a sledging party of seven, which was away from the ship for eighty-four days, all succumbed to scurvy except Ayles, the only abstainer among them, and Lieutenant Aldrich who was almost an abstainer. Four others of the abstainers are also referred to as having kept their health perfectly, though they took fully their share in the hard work of the

expedition. * * * * It may be noticed that the testimony of the whole ship's company — doctors and officers included — is unanimous and conclusive against the serving out of stimulants during the day. They emphatically state that no work can be done upon grog."[1]

Mr. Colvin's experience in the Adirondacks as stated in his *First* and *Second Reports on the Topographical Survey of the Adirondack Wilderness of New York* is entirely in accord with that of Captain Nares. "Not a particle of alcohol or fermented liquor of any kind," he says in his *First Report*, "was used by any member of the party. The result has been subordination, steady work, health and success."[2] And in his *Second Report* he states: "As during previous seasons, the use of alcoholic or fermented liquor of any kind, was prohibited to any one connected with the survey, and neither while engaged in the laborious climbing of the mountains, nor while encountering bitterest storms, or the severity of winter's snows, was any stimulant used or carried. The result has been steady and persistent work and men who had believed stimulants absolutely necessary have expressed a change of opinion. But for the stern and strict enforcement of this rule, fatal accidents might have occurred in the mountain climbing."[3]

Does not then this molecular theory, if I may so call it, fall to the ground if it can neither be shown that alcohol is capable of direct oxidation within the system, nor that it imparts strength to the frame by maintaining the vital processes? Of course these terms are vague and it is difficult to estimate results into which they enter, but so long as alcohol cannot replace assimilable food and does not as we believe, enable man the better to withstand fatigue,

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[1] *Boston Journal of Chemistry*, Feb., 1877, p. 94.

[2] *Op. cit.*, p. 43.

[3] *Op. cit.*, p. 162.

we submit that it rests with those who maintain this theory to show in what manner this 'interior work' is performed.

And now in conclusion if it be said, — is it then rational to suppose that alcoholic liquors have no uses, save in a medicinal sense; that they are utterly uncalled for, and that the testimony in their favor of thousands upon thousands who from time immemorial have made use of them is to go for nothing — we would say, no, they have uses; such testimony should not hastily be refused consideration. There is a physiological value which substances may have apart from those grosser uses by which our bodies are built up and our inner fires maintained; a value which cannot be estimated in pounds of flesh or degrees of bodily heat, but finds expression in more subtile kinds of matter and forces harder to be measured. That alcohol acts upon the nervous system, stimulating it to action, there can be no doubt, and do we not all believe that mental influences affect the bodily functions. Our only endeavor this evening has been to show that it cannot logically be claimed as a food in the ordinarily accepted sense in which that term is employed, but that it may have less material uses and produce other and beneficial results we would not for a moment deny. Peculiar idiosyncrasies have much to do with its effects and while there are those to whom even in small quantities it is harmful, there are many others, who, using it as the other good things of this life should be used, in moderation, may receive no injury and perhaps derive from it not only enjoyment but benefit. Let it be remembered that even if in a state of perfect health the human system has no need of stimulants, there are few, if any of us who are in possession of so valuable a legacy; that no one at present lives upon the simple fare which supported his early ancestors, and that higly civilized beings require a greater variety of substances for their sustenance than brutes. We indulge in many luxuries which in themselves

are rather harmful than beneficial, and yet we would not willingly be deprived of them, even did we think we might live a year or two longer by our abstemiousness. Alcoholic drinks belong to this class of substances, of which they are undoubtedly the oftenest abused members. So long, however, as we continue to live as, in most respects, do those of the nineteenth century, total abstinence in this respect alone seems, to say the least, inconsistent, if not uncalled for.